Volunteer Lake Assessment Program Individual Lake Reports

WARREN LAKE, ALSTEAD, NH

MORPHOMETRIC DATA

Watershed Area (Ac.):	3,237	**Max. Depth (m):**	4.2	**Flushing Rate (yr^{1})**	4.2
Surface Area (Ac.):	185	**Mean Depth (m):**	2	**P Retention Coef:**	0.57
Shore Length (m):	5,500	**Volume (m^{3}):**	1,503,500	**Elevation (ft):**	1200

TROPHIC CLASSIFICATION

Year	Trophic class
1991	OLIGOTROPHIC
2005	MESOTROPHIC

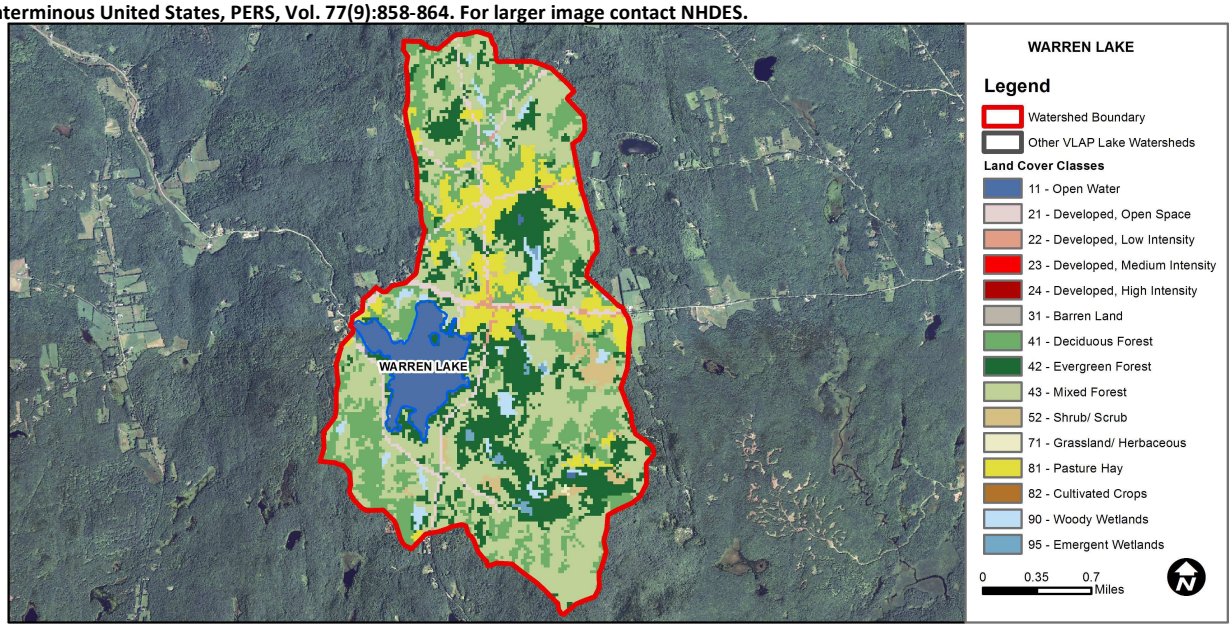
KNOWN EXOTIC SPECIES

The Waterbody Report Card tables are generated from the 2012 305(b) report on the status of N.H. waters, and are based on data collected from 2001-2011.

Designated Use	Parameter	Category	Comments
Aquatic Life	Phosphorus (Total)	Slightly Bad	>/=5 samples and median is >threshold.
	pH	Bad	>10%, with a minimum of 2, samples exceed criteria, with 1 or more by a large margin.
	D.O. (mg/L)	Very Good	At least 10 samples with 0 exceedances of criteria.
	D.O. (% sat)	Encouraging	< 10 samples and no exceedance of criteria. More data needed.
	Chlorophyll-a	Slightly Bad	>5 samples and median is > threshold.
Primary Contact Recreation	E. coli	Very Good	All bacteria samples <75% of geometric mean criteria, but not enough to calculate geometric mean. Or, all bacteria samples are < single sample criteria and calculated Geometric means are less than geometric mean criteria.
	Chlorophyll-a	Very Good	At least 10 samples with 0 exceedances of criteria.

WATERSHED LAND USE SUMMARY

Fry, J., Xian, G., Jin, S., Dewitz, J., Homer, C., Yang, L., Barnes, C., Herold, N., and Wickham, J., 2011. Completion of the 2006 National Land Cover Database for the Conterminous United States, PERS, Vol. 77(9):858-864. For larger image contact NHDES.

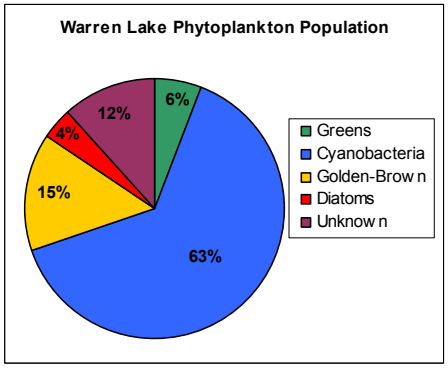


Land Cover Category	% Cover	Land Cover Category	% Cover	Land Cover Category	% Cover
Open Water	6.52	Barren Land	0	Grassland/Herbaceous	0.04
Developed-Open Space	3.66	Deciduous Forest	19.12	Pasture Hay	10.13
Developed-Low Intensity	0.58	Evergreen Forest	19.45	Cultivated Crops	0
Developed-Medium Intensity	0	Mixed Forest	35.78	Woody Wetlands	2.31
Developed-High Intensity	0	Shrub-Scrub	1.88	Emergent Wetlands	0.44

VOLUNTEER LAKE ASSESSMENT PROGRAM INDIVIDUAL LAKE REPORTS
WARREN LAKE, ALSTEAD, NH
2012 DATA SUMMARY

OBSERVATIONS AND RECOMMENDATIONS (*Refer to Table 1 and Historical Deep Spot Data Graphic)*

- **CHLOROPHYLL-A:** Chlorophyll levels increased slightly in August but overall levels decreased from those measured from 2007 to 2011. Historical trend analysis indicates chlorophyll levels fluctuate from year to year.
- **CONDUCTIVITY/CHLORIDE:** Deep spot, Outlet, Pickerel Cove, and Smith Hill Brook conductivity and chloride were generally low. Carmen Cove and Colburn Hill Brook conductivity and chloride were slightly elevated, and Spruce River conductivity and chloride were greatly elevated.
- **TOTAL PHOSPHORUS:** Deep spot phosphorus levels were relatively low. Epilimnetic (upper water layer) phosphorus decreased again in 2012 from elevated levels measured from 2005 to 2010. Historical trend analysis indicates epilimnetic phosphorus tends to fluctuate from year to year. Carmen Cove and Colburn Hill brooks experienced elevated phosphorus levels in August and sediment was noted in the samples which likely contributed to the phosphorus. Spruce River experienced slightly elevated phosphorus levels and small amounts of sediment were noted in the August sample.
- **TRANSPARENCY:** Transparency improved from 2011 likely due to the decreased algal growth. Historical trend analysis indicates a stable transparency since monitoring began.
- **TURBIDITY:** Turbidity was generally elevated in the August tributary samples likely due to low flow conditions and sediment contamination.
- **PH:** Historically, pH levels tend to be lower than desirable at the deep spot.
- **RECOMMENDED ACTIONS:** Continue to conduct chloride monitoring and spring runoff sampling particularly in Carmen Cove, Colburn Hill and Spruce River to establish a baseline data set and better determine causes of elevated conductivity. The improved water quality in 2012 was aided by the dry weather conditions and lack of stormwater runoff. Educate watershed residents on ways to reduce stormwater runoff from their properties utilizing DES' "Homeowner's Guide to Stormwater Management". Keep up the great work!



NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.
Chloride: < 230 mg/L (chronic)
E. coli: > 88 cts/100 mL – public beach
E. coli: > 406 cts/100 mL – surface waters
Turbidity: > 10 NTU above natural level
pH: 6.5-8.0 (unless naturally occurring)

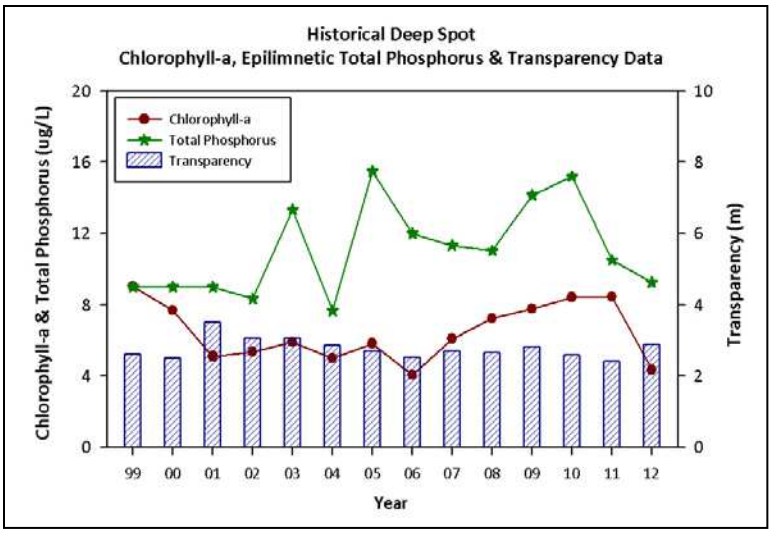
NH Median Values: Median values for specific parameters generated from historic lake monitoring data.
Alkalinity: 4.9 mg/L
Chlorophyll-a: 4.58 mg/m^3
Conductivity: 40.0 uS/cm
Chloride: 4 mg/L
Total Phosphorus: 12 ug/L
Transparency: 3.2 m
pH: 6.6

Table 1. 2012 Average Water Quality Data for WARREN LAKE

Station Name	Alk.	Chlor-a	Chloride	Cond.	Total P	Trans.	Turb.	pH
	mg/l	ug/l	mg/l	uS/cm	ug/l	m	ntu	
						NVS		
Carmen Cove Brook			16	113.0	20		1.37	6.40
Colburn Hill Brook			15	125.8	26		4.69	6.69
Deep Epilimnion	3.9	4.35	7	56.1	9	2.88	1.23	6.69
Deep Hypolimnion				56.3	12		1.65	6.62
Outlet				58.0	16		1.72	6.55
Pickeral Cove Brook			7	62.8	14		0.25	6.31
Smith Hill Brook			3	33.8	11		0.91	6.05
Spruce River			47	220.0	25		1.60	6.71

HISTORICAL WATER QUALITY TREND ANALYSIS

Parameter	Trend	Explanation
Chlorophyll-a	Variable	Data fluctuate annually, but are not significantly increasing or decreasing.
Transparency	Stable	Data not significantly increasing or decreasing.
Phosphorus (epilimnion)	Variable	Data fluctuate annually, but are not significantly increasing or decreasing.



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